

PATENT ABSTRACTS OF JAPAN

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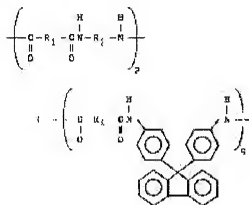
(54) AROMATIC POLYAMIDE FILM

(57)Abstract:

PURPOSE: To obtain the film excellent in heat resistance and mechanical properties, capable of giving drawn films small in the decline of the mechanical properties in the transverse direction, useful as e.g. a magnetic tape, by copolymerizing 9,9-bis(4-aminophenyl)fluorene and other relevant monomer(s).

CONSTITUTION: 2-Chloro-p-phenylenediamine, 4,4'-diaminodiphenyl ether, etc., and 9,9-bis(4-aminophenyl)fluorene are homogeneously agitated and dispersed in a solvent such as N-methyl-2-pyrrolidone. The resultant dispersion is chilled to 10°C in an ice bath and then incorporated with terephthaloyl dichloride followed by calcium carbonate. The mixture is agitated at 40°C for 3hr to conduct a dehydrochlorination, and the resultant viscous solution is cast on a glass plate with an applicator and then dried in a hot-air oven at 120°C followed by peeling the resultant film off the glass plate, and the film is then drawn and heat treated, thus obtaining the aromatic polyamide film with the recurring unit of the

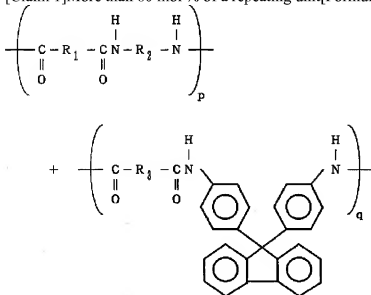
formula [R1-R3 are phenylene, polyphenylene, etc., each; molar ratio p/q is (80:20) to (99.9:0.1)] accounting for ≥60mol% of the total recurring units.



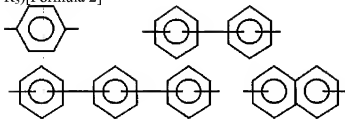
CLAIMS

[Claim(s)]

[Claim 1] More than 60 mol % of a repeating unit [Formula 1]



The aromatic polyamide film characterized by the thing, ** and others. (Being here. R₁, R₂, and R₃) [Formula 2]



It may be chosen more, two or more sorts of these may be contained, and a part of hydrogen on this aromatic ring may be replaced by the alkoxy group, nitro group, or cyano group of the alkyl group of halogen, C₁ - C₃, C₁ - C₃. The range of the mole ratio of p and q is 80:20 to 99.9:0.1.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the aromatic polyamide film excellent in heat

resistance and a mechanical characteristic.

[0002]

[Description of the Prior Art]Diisocyanate, dicarboxylic acid, or the aromatic polyamide film obtained from diamine and JI acid chloride, Since especially the Para orientation system aromatic polyamide film has the outstanding heat resistance and mechanical characteristic, it is used for a recording material use, an electric electronic use, the information related field, etc. which make representation the base film of the magnetic tape of a thin film.

[0003]

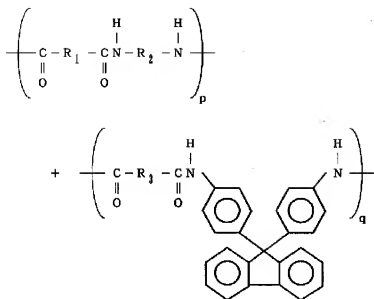
[Problem(s) to be Solved by the Invention]However, in the field of the base film of recent years, a flexible printed circuit board, a magnetic adjuster, especially the magnetic tape of a thin film, The request of a film which excelled before in a mechanical characteristic, especially Young's modulus further, and was excellent in Young's modulus also not only in the longitudinal direction (MD) of a film but the cross direction (TD) is becoming strong.

[0004]Although the method of raising a mechanical physical property to this request by extension generally performed in film manufacture is tried also in the Para orientation system aromatic polyamide film, Since the mechanical physical property of the non-extending direction falls substantially, the obtained film stops being suitable for practical use, even if it extends to one way and obtains high Young's modulus in the extension direction. If it is going to extend in the direction extended previously and the direction which makes a right angle in order to compensate this, the molecular structure which polymer has intrinsically -- stiffness -- therefore, it being difficult for extension to give sufficient mechanical property difficult in many cases for TD, and, There is a possibility of a film becoming weak and stopping being suitable for practical use as industrial materials, such as magnetic adjusters, such as a base film of magnetic tape, and a film for FPC, even if it is able to extend and the case where the mechanical physical property of MD falls substantially conversely, and MD and TD can obtain high Young's modulus.

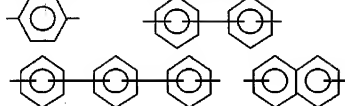
[0005]this invention is excellent in the heat resistance and the mechanical characteristic which are made to be able to cancel the above-mentioned fault looked at by the Prior art, and can respond to the request of the industrial world, and provides the aromatic polyamide film in which the fall of the mechanical physical property of the non-extending direction is very small in an oriented film.

[0006]

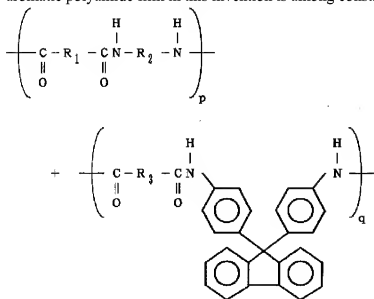
[Means for Solving the Problem]This invention is more than 60 mol % of a repeating unit, in order to solve this technical problem.[Formula 3]



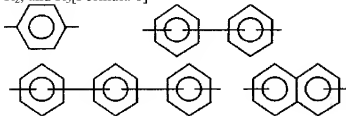
The aromatic polyamide film characterized by the thing, ** and others.
[0007](Being here. R₁, R₂, and R₃)[Formula 4]



It may be chosen more, two or more sorts of these may be contained, and a part of hydrogen on this aromatic ring may be replaced by the alkoxy group, nitro group, or cyano group of the alkyl group of halogen, C₁ - C₃, C₁ - C₃. The range of the mole ratio of p and q is 80:20 to 99.9:0.1. The aromatic polyamide film in this invention is among constitutional units. [Formula 5]



a repeating unit come out of and expressed -- more than 60 mol % -- it is what is included -- R₁, R₂, and R₃[Formula 6]



It is alike and needs to be chosen out of the thing of the structure expressed. The reason by a substantial repeating unit having high regularity, and being an upright structure, and including an aromatic ring A high mechanical property, It is because the purpose of this invention that heat resistance is revealed and also the fall of the mechanical property of the non-extending direction is very small in an oriented film by [with a specific fluorene group] carrying out quantity content is attained. Less than [60 mol %], the repeating unit in this invention Heat resistance and mechanical properties, Especially the decline in Young's modulus is caused, further, since the mechanical property of the non-extending direction falls substantially in an oriented film, the purpose of this invention cannot be attained, and if R₁, R₂, and R₃ are not the things of the above-mentioned structure, a mechanical property and heat resistance will fall substantially.

[0008]A range of a ratio of p and q which constitute the above-mentioned repeating unit in this invention is p:q=80:20-99.9:0.1. In an aromatic polyamide film of this invention, this is because an effect of this invention that a mechanical property fall of the non-extending direction is very small in an oriented film is acquired, when the ratio q of ***** containing a fluorene group is in a mentioned range. If q is smaller than 0.1, the feature that a mechanical properties fall of the non-extending direction is small will be lost, If q is larger than 20, mechanical properties cannot fall [the extension direction and the non-extending direction] because of dimension height of a fluorene group, and an effect of this invention that a fall of the mechanical properties of the non-extending direction is still very smaller cannot be fulfilled. p: Especially if a ratio of q is within the limits of p:q=80:20-99.9:0.1, are not limited, but. A range of the range of p:q=85:15-99.7:0.3 is p:q=90:10-99.5:0.5 desirable still more preferably from a point of suppressing a mechanical properties fall of the non-extending direction as much as possible, a point which keeps the mechanical properties of the extension direction high, and a point of economical efficiency (cost).

[0009]A monomer used in order to obtain an aromatic polyamide film of this invention is explained taking the case of diamine and JI acid chloride which are used by low-temperature solution polymerization here, although it changes with polymerization methods.

[0010]In order to obtain an aromatic polyamide film of this invention, and to introduce a fluorene group, it is necessary to perform copolymerization using a diamine component containing a fluorene group. As such diamine, although a 9,9-bis(4-aminophenyl)fluorene (henceforth, BAFL) is mentioned as an example of representation, It does not interfere, even if a part of hydrogen on an aromatic ring of BAFL uses what was replaced by a substituent, for example, a 9,9-bis(3-methyl, 4-aminophenyl)fluorene, a 9,9-bis(3-ethyl, 4-aminophenyl)fluorene, etc.

[0011]As a diamine component which constitutes a repeating unit expressed with the ratio p, A p phenylenediamine, 2-chloro p phenylenediamine, a 2,3-dichloro p phenylenediamine, A 2,5-

dichloro p phenylenediamine, a 2,6-dichloro p phenylenediamine, A 2,3,5-trichloro p phenylenediamine, 2-bromo p phenylenediamine, A 2,6-dibromo p phenylenediamine, 2-fluoro p phenylenediamine, A 2,6-difluoro p phenylenediamine, 2-nitro p phenylenediamine, A 2,6-dinitro p phenylenediamine, 2-cyano p phenylenediamine, A 2,6-dicyano p phenylenediamine, 2-methyl p phenylenediamine, A 2,6-dimethyl p phenylenediamine, 2-ethyl p phenylenediamine, 4,4'-biphenylene diamine, 3,3'-biphenylene diamine, 3,4'-biphenylene diamine, 1,4-naphthalenediamine, 1,5-naphthalenediamine, 2,6-naphthalenediamine, and 1,4-bis(4-aminophenyl)benzene are mentioned as an example of representation.

[0012]As a JI acid chloride ingredient, terephthalic acid chloride, 2-chloroterephthalic acid chloride, 2,3-dichloroterephthalic acid chloride, 2,5-dichloroterephthalic acid chloride, 2,6-dichloroterephthalic acid chloride, 2,3,5-trichloroterephthalic acid chloride, 2-bromoterephthalic acid chloride, 2,6-dibromoterephthalic acid chloride, 2-fluoroterephthalic acid chloride, 2,6-difluoroterephthalic acid chloride, 2-nitroterephthalic acid chloride, 2,6-dinitroterephthalic acid chloride, 2-cyanoterephthalic acid chloride, 2,6-dicyanoterephthalic acid chloride, 2-methylterephthalic acid chloride, 2,6-dimethylterephthalic acid chloride, 2-ethylterephthalic acid chloride, 4, and 4'-biphenylcarboxyl chloride, - biphenylcarboxyl chloride, and 3 and 3', 4'-biphenylcarboxyl chloride, 1,4-naphthalene dicarbonyl chloride, 1,5-naphthalene dicarbonyl chloride, 2,6-naphthalene dicarbonyl chloride, and 1,4-bis(p-phenylenecarbonyl chloride)benzene are mentioned as an example of representation.

[0013]As stated previously, aromatic polyamide which constitutes this invention says what includes the above-mentioned repeating unit not less than 60%, and even if copolymerization of the 40% of repeating units is carried out to other ingredients for the purpose of raising the solubility of a polymer, giving moderate pliability to an obtained film, etc., it does not interfere.

[0014]As such a copolymerization unit, as diamine, for example, a meta-phenylenediamine, A 4-chloro meta-phenylenediamine, 4,4'-diaminodiphenyl ether, A 4,4'-diaminodiphenyl sulfone, 4, and 4'-diamino diphenyl sulfide, 4,4'-diaminodiphenylmethane, 4,4'-diaminodiphenyl ketone, 3,3'-diaminodiphenyl ether, 3,3'-diaminodiphenyl sulfone, What a 3,3'-diamino diphenyl sulfide, 3,4'-diaminodiphenyl ether, etc. are mentioned, and has bending structure like a meta-phenylenediamine, 4,4'-diaminodiphenyl ether, and 4,4'-diaminodiphenylmethane is preferred. As JI acid chloride, isophthalic acid chloride, 4-chloroisophthalic acid chloride, 4,6-dichloroisophthalic acid chloride, 4-bromoisophthalic acid chloride, 4-fluoroisophthalic acid chloride, 4-nitroisophthalic acid chloride, 4-methylisophthalic acid chloride, 4-cyanoisophthalic acid chloride, etc. are mentioned as an example of representation.

[0015]1-200 micrometers in thickness are desirable still more preferred, and an aromatic polyamide film obtained by this invention is 1-50 micrometers.

[0016]In an unstretched film, Young's modulus more than 10^8 of 800kg/mm is desirable still more preferred, and an aromatic polyamide film of this invention is more than $900\text{kg}/\text{mm}^2$. In an uniaxial stretched film, a certain thing has $[1500\text{kg}/\text{mm}^2$ and more than $800\text{kg}/\text{mm}^2]$ respectively desirable Young's modulus of the extension direction and the non-extending direction. Next, it is explanation **** about a method for obtaining an aromatic polyamide film by this invention.

[0017]The diisocyanate method to which aromatic polyamide of this invention makes diisocyanate and dicarboxylic acid react at an elevated temperature in a polar solvent, Diamine, the diamine process to which JI acid chloride is made to react at low temperature in a polar solvent, There are interfacial polymerization etc. which melt diamine and JI acid chloride in a poor solvent to another side, respectively, contact it, and obtain a polymer, Even if it polymerizes

by which method, it does not interfere, but the diamine process from which polymer of a degree of polymerization stable since a reaction advanced on mild conditions is obtained is desirable, and explains here taking the case of the diamine process.

[0018]As a polymerization method, (1) diamine is dissolved or slurred with a polar solvent at temperature of 0-70 **, and they are a solution, melt, or a method of it being powdered, and adding, and also continuing 1 - 15-hour churning, and completing a reaction about an acid chloride thing under churning. (2) Even if an acid chloride thing, a method to which add and a thing of diamine which mixed powder respectively is made to react, etc. are in a polar solvent and it is compounded by which method, don't interfere. A polar solvent said here is an organic solvent of aprotic systems, such as N-methyl-2-pyrrolidone, dimethylacetamide, dimethylformamide, hexamethylphosphoramide, and dimethylsulfoxide. It is desirable from a point of the stability of a solution to make after an appropriate time neutralize amine and chloride by which it is generated from acid chloride with inorganic alkali, such as calcium carbonate and lithium carbonate, etc.

[0019]Intrinsic viscosity of aromatic polyamide polymer produced by making it above has the preferred range of 0.5-7.0. There is a possibility that a film obtained may become it is very weak and lacking in practicality, by less than 0.5. When too high, there is a possibility that solution viscosity may rise extremely.

[0020]In this way, whether it uses for film production as it is or obtained aromatic polyamide polymer uses for film production a dope which dried after rinsing with a lot of water and removing chloride, a hydrochloride, etc., and a solvent was made to dissolve in after an appropriate time, it does not interfere.

[0021]A dope used for film production does not interfere, even if 5 to 40% of the weight of a thing is preferred from a field of the stability of film production, and it contains mineral, such as a lithium chloride and a lithium bromide, as polymer concentration in order to raise the solubility of polymer.

[0022]Next, a film production method of an aromatic polyamide film of this invention is explained.

[0023]When mineral salt as a dissolution auxiliary agent and a neutralizer contains in a film production undiluted solution, a dryness-and-moisture type or wet process is preferred. In producing a film by a dryness-and-moisture type method, an undiluted solution is extruded on base materials, such as a drum and an endless belt, from a cap, and it considers it as a thin film, and subsequently to a dry type process, it is introduced. And a solvent is dispersed from this thin film layer, and it condenses, and a thin film is dried until it has free-standing. Under the present circumstances, it is necessary to adjust so that a solvent may not disperse rapidly from a film surface, therefore 50 ** - 200 ** are preferably dried at 70 ** - 150 ** for tens of seconds - tens minutes. It is because long-time-izing of drying time, generating of a void by heating rapid above 200 **, surface roughness, etc. happen and a film practical as industrial material and a magnetic adjuster is not obtained below 50 **. A film which finished the above-mentioned dry type process exfoliates from a base material, and is introduced into a wet process. An ionicity inorganic compound contained in a film here is removed. Generally this bath may consist of a drainage system medium, and may contain an organic solvent, mineral salt, etc. other than water. However, generally a moisture content is contained not less than 50% preferably not less than 30%, and the degree of bath temperature is usually used at 0-100 **.

[0024]At this wet process, a film which exfoliated is immersed under stress during this bath, and an inorganic compound in a film is preferably extracted to 0.05% or less less than 0.1. The amounts of mineral salt as a dissolution auxiliary agent are neutralizing salt which many generated

by neutralization or neutralizing salt, and takes doses, a little amounts of mineral salt come out, and their extraction speed is quick for a certain reason, and mineral salt under bath and recovery of an organic solvent are also easy for them.

[0025] Before a film which finished a dry type process is introduced into a wet process, extension is performed in the direction of a film length hand (MD) within the limits of 1.05 to 2.5 times during a wet bath or after an end of a wet process. Improvement is not considered to be 1.05 or less times by the mechanical property of the extension direction, but fibrillation arises in the extension direction that they are 2.5 or more times, and only an extremely weak film is obtained. In this way, although an obtained film ranks second, is preferably boiled and heat-treated under 60-minute stress from 10 seconds at 250 °C - 350 °C, 200 °C - 500 °C and turns into a final film, It can extend in the 1.05 to 2.5 times as many ranges to a film width direction (TD) at the time of heat treatment before heat treatment, and a biaxially oriented film can also be obtained.

[0026] When producing a film with wet process, a method of extruding an undiluted solution during a bath for direct film production from a cap, or once extruding on base materials, such as a drum, and introducing during the above-mentioned wet bath the whole base material is adopted. In a wet bath, extraction of an ionicity inorganic compound and an organic solvent which were contained on a film is performed. In order for a wet bath to consist of the same presentation as said film production bath for dryness-and-moisture types and to adjust this demineralization and deliquoring speed further, it is the same as that of the above to add an organic solvent, mineral salt, etc. It can extend within the limits of 1.05 to 2.5 times to MD like a dryness-and-moisture type method during a wet bath or after an end of a wet process. a film after an end of a wet process like a dryness-and-moisture type method, although it is alike under 60-minute stress, it is preferably heat-treated from 10 seconds at 250 °C - 350 °C and 200 °C - 500 °C become a final film. It can extend in the 1.05 to 2.5 times as many ranges to TD at the time of heat treatment before heat treatment, and a biaxially oriented film can also be obtained.

[0027]

[A measuring method of weighted solidity] Weighted solidity of this invention is based on the following measuring method.

[0028] (1) It measured according to Young's modulus, intensity JIS-1702, and ASTM D882-67.

[0029] (2) Intrinsic viscosity $\eta_{sp}/C = \ln(t/t_0)/C$ (dl/g)

It is here and is C : Several tons gram of a polymer in solution 1dl: Down flowing time of only a solvent (second)

t : down flowing time of a solution (second)

It measured at 30 °C, using N-methyl-2-pyrrolidone as a solvent.

[0030]

[Example]

32.78 g (0.23 mol) of example 12-chloro p phenylenediamines, 4, 4'-diaminodiphenyl ether 3.50g. 600 ml of N-methyl-2-pyrrolidone is taught to a 1000-ml 4 mouth flask, churning distribution of (0.0175 mol) and 0.871 g (0.0025 mol) of the 9,9-bis(4-aminophenyl)fluorenes (BAFL) is uniformly carried out in a nitrogen air current, and it cools at 10 °C by an ice bath. When 50.78 g (0.25 mol) of terephthalic acid chloride was gradually added in this system so that the degree of flask system internal temperature might not exceed 30 °C, and churning was continued for after [the completion of addition] 1 hour, the polymerization system became a very consistency solution. The calcium carbonate 25.0g (0.25 mol) was added to this solution, it agitated at 40 °C for 3 hours, and dehydrochlorination was performed. When this polymer solution was measured with the rotational viscometer, it was 3300 poise, and intrinsic viscosity was 3.2. This dope was

cast by the applicator at about 100-micrometer thickness on 5 mm in thickness, and a glass plate (300 mm x 300 mm), and it exfoliated from the after-desiccation glass plate for 10 minutes in 120 °C hot wind oven, fixed to the uniaxial-stretching machine, and extended in the air. Then, heat setting was carried out for 1 minute under stress in 330 °C hot wind oven after immersion for 15 minutes into a 40 °C stream. Heat setting was carried out like the previous extension and extension [to rectangular directions]-film which extended similarly back. The physical properties of the obtained film are shown in Table 1 and Table 2.

[0031]It cast by the applicator at about 100-micrometer thickness on dope 5 mm in thickness prepared in example 2 Example 1, and a glass plate (300 mm x 300 mm), and the film which immersed for 15 minutes into a 40 °C stream, and exfoliated from the base material was extended underwater. Subsequently, heat setting was carried out for 1 minute under stress in 330 °C hot wind oven. Heat setting was carried out like the previous extension and extension [to rectangular directions]-film which extended similarly back. The physical properties of the obtained film are shown in Table 1 and Table 2.

[0032]23.52 g (0.218 mol) of example 3 p phenylenediamines, 600 ml of N-methyl-2-pyrrolidone is taught to a 1000-ml 4 mouth flask, churning distribution of the 4,4'-diaminodiphenyl ether 5.01g (0.025 mol) and the BAFL2.613g (0.0075 mol) is uniformly carried out in a nitrogen air current, and it cools at 10 °C by an ice bath. When 59.37 g (0.25 mol) of 2-chloroterephthalic acid chloride was gradually added in this system so that the degree of flask system internal temperature might not exceed 30 °C, and churning was continued for after [the completion of addition] 1 hour, the polymerization system became a very consistency solution. The calcium carbonate 25.0g (0.25 mol) was added to this solution, it agitated at 40 °C for 3 hours, and dehydrochlorination was performed. When this polymer solution was measured with the rotational viscometer, it was 3400 poise, and intrinsic viscosity was 3.3. Desiccation, extension, and heat treatment were performed for this dope like Example 1. The physical properties of the obtained film are shown in Table 1 and Table 2.

[0033]33.15 g (0.233 mol) of comparative example 12-chloro p phenylenediamines, 600 ml of N-methyl-2-pyrrolidone is taught to a 1000-ml 4 mouth flask, churning distribution of the 4,4'-diaminodiphenyl ether 3.50g (0.0175 mol) is uniformly carried out in a nitrogen air current, and it cools at 10 °C by an ice bath. When 50.78 g (0.25 mol) of terephthalic acid chloride was gradually added in this system so that the degree of flask system internal temperature might not exceed 30 °C, and churning was continued for after [the completion of addition] 1 hour, the polymerization system became a very consistency solution. The calcium carbonate 25.0g (0.25 mol) was added to this solution, it agitated at 40 °C for 3 hours, and dehydrochlorination was performed. When this polymer solution was measured with the rotational viscometer, it was 3200 poise, and intrinsic viscosity was 3.2. The same desiccation as Example 1, extension, and heat treatment were performed for this dope. A result is shown in Table 1 and Table 2.

[0034]600 ml of N-methyl-2-pyrrolidone is taught to a 1000-ml 4 mouth flask, churning distribution of 33.29 g (0.248 mol) of comparative example 2 p phenylenediamines and the BAFL0.871g (0.0025 mol) is uniformly carried out in a nitrogen air current, and it cools at 10 °C by an ice bath. In this system, 50.76 g (0.25 mol) of isophthalic acid chloride was gradually added so that the degree of flask system internal temperature might not exceed 30 °C, and when churning was continued for after [the completion of addition] 1 hour, the polymerization system became a very consistency solution. The calcium carbonate 25.0g (0.25 mol) was added to this solution, it agitated at 40 °C for 3 hours, and dehydrochlorination was performed. When this polymer solution was measured with the rotational viscometer, it was 2700 poise, and intrinsic viscosity was 2.5.

The same desiccation as Example 1, extension, and heat treatment were performed for this dope. A result is shown in Table 1 and Table 2.

[0035] 600 ml of N-methyl-2-pyrrolidone is taught to a 1000-ml 4 mouth flask, churning distribution of 20.28 g (0.188 mol) of comparative example 3 p phenylenediamines and the BAFL21.78g (0.0625 mol) is uniformly carried out in a nitrogen air current, and it cools at 10 ** by an ice bath. When 59.37 g (0.25 mol) of 2-chloroterephthalic acid chloride was gradually added in this system so that the degree of flask system internal temperature might not exceed 30 **, and churning was continued for after [the completion of addition] 1 hour, the polymerization system became a very consistency solution. The calcium carbonate 25.0g (0.25 mol) was added to this solution, it agitated at 40 ** for 3 hours, and dehydrochlorination was performed. When this polymer solution was measured with the rotational viscometer, it was 2900 poise, and intrinsic viscosity was 2.6. The same desiccation as Example 1, extension, and heat treatment were performed for this dope. A result is shown in Table 1 and Table 2.

[0036]

[Table 1]

表1

	ジアミン	酸クロ	モ ル 比			製膜法
			ジアミン (%)	酸クロ (%)	BAFL (%)	
実施例 1	CPA/DAE	TPC	92/7	100	1	乾湿式
実施例 2	CPA/DAE	TPC	92/7	100	1	湿式
実施例 3	PPD/DAE	CTPC	87/10	100	3	乾湿式
比較例 1	CPA/DAE	TPC	93/7	100	0	乾湿式
比較例 2	PPD	IPC	99	100	1	乾湿式
比較例 3	PPD	CTPC	75	100	25	乾湿式

CPA：2-クロロパラフェニレンジアミン

DAE：4, 4'-ジアミノジフェニルエーテル

PPD：パラフェニレンジアミン

TPC：テレフタル酸クロライド

IPC：イソフタル酸クロライド

CTPC：2-クロロテレフタル酸クロライド

BAFL：9, 9-ビス（4-アミノフェニル）フルオレン

[Table 2]

表2

	未延伸フィルム		一軸延伸 (MDX=1.20) *		T D X	二軸延伸 (MDX=1.20) *	
	ヤング率 (kg/mm ²)	強 度 (kg/mm ²)	ヤング率 (kg/mm ²)	強 度 (kg/mm ²)		ヤング率 (kg/mm ²)	強 度 (kg/mm ²)
実施例1	1180	36	1800/1200	50/33	1.10	1790/1550	50/46
実施例2	1210	36	1830/1190	51/34	1.10	1840/1580	50/45
実施例3	1120	34	1630/1040	47/32	1.15	1500/1430	45/43
比較例1	1170	36	1730/ 880	49/28	1.40	1310/1560	41/46
比較例2	720	23	850/ 600	28/19	1.25	710/ 840	22/27
比較例3	760	25	940/ 620	29/21	1.30	630/ 950	20/30

*ヤング率、強度の項はMD (長手方向) /TD (巾方向) の値を示す

MDX: 長手方向の延伸倍率

TDX: 巾方向の延伸倍率

[0037]

[Effect of the Invention]The aromatic polyamide film of this invention is excellent in heat resistance and a mechanical property, In an uniaxial stretched film, the fall of the mechanical property of the non-extending direction is very small by [specific] having carried out quantity introduction in a fluorene group, Since it has the outstanding characteristic that the extension direction and the non-extending direction have a high mechanical property in a biaxially oriented film, are applied to various applicable fields, such as a base film use for high-density magnetic recording tapes, a wire covering use, a capacitor, and a flexible printed circuit board, but, It excels in the base film use for high-density magnetic recording tapes of the thin film especially.

[Translation done.]